

Forty Years of Political Ecology in the Peruvian Upper Forest: The Case of Upper Huallaga

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Deforestation in Peru's Amazon basin is directly related to several government policies instituted in this century. By the 1980s government economic policies, regional political relations, the government drug-eradication program in conjunction with the United States, and the Shining Path guerrilla movement had multiplied the rate of deforestation by a factor of three. Although two-thirds of the country is forest, forest products represented a minuscule percentage of Peru's gross national product early in this century. The government encouraged massive migration to the forests with a road-building program during the 1940s in order to tap some of this wealth, relieve socioeconomic problems elsewhere, and enhance national security. Since the mid-1970s farmers have concentrated on coca production, because it is three to four times more profitable than legal crops, and their rights to do so have been championed by the terrorist organization Shining Path.

In this essay we examine these problems from the perspective of agricultural systems, which constitute specific technological methods by which human societies obtain edible crops. However, those systems and certain forms of social organizations correspond in significant ways, as do agriculture systems and specific modes of production. Likewise, agricultural systems tend to associate with different levels of local and regional demographic densities. Equally important is the relationship of one spe-

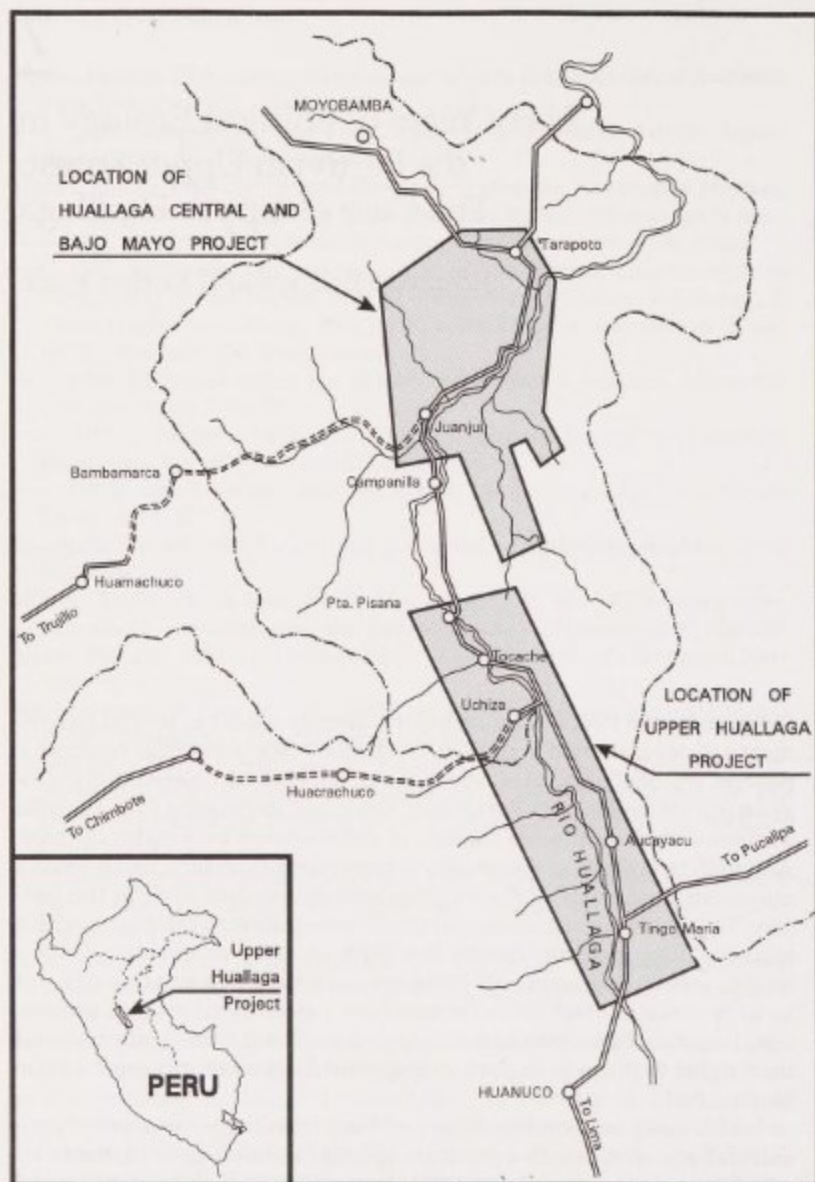


Figure 7.1 Huallaga Valley

cific agricultural system, the political structure, and the effect of specific economic policies on the peasant population. Expressed differently, the analysis of diverse agricultural systems and rural environmental processes cannot be restricted to the study of their technological characteristics (Schmink and Wood 1987; Blaikie and Brookfield 1987; Peluso 1990).

If the massive process of deforestation in the Peruvian Amazon is a direct consequence of the agricultural practices of peasant Andean immigrants, especially in the upper forest region (*selva alta*), it is necessary to examine the social and economic causes of deforestation.¹ In an effort to understand the deforestation process in the Peruvian Amazon this essay analyzes the expansion of the agricultural frontier in the upper Huallaga, located in the central upper forest (see figure 7.1) and representing the largest area of coca (*Erythroxylon coca*) cultivation in the world.

Deforestation in the Peruvian Amazon

The greatest renewable resource in Peru is the abundant forest, 96% of which is located in the Amazon watershed, covering some 93% of that area (Bueno 1984). There are 72.8 million hectares of natural rain forest, 170,000 hectares of cultivated forest (forest managed for the purpose of selecting certain species), and 10.3 million hectares of land suitable for forestation; together these comprise 64% of Peru. However, because of a series of historical, economic, and cultural factors, forest resources account for less than 1% of the gross national product (Bueno 1984).

In the late 1970s a series of investigators issued extremely pessimistic and alarming projections regarding the rates of deforestation of the Peruvian Amazon. The analyses of Jorge Malleux (1975) and Marc Dourojeanni (1983) stressed the immense size of the territory being deforested and how it resulted from the migratory agriculture practiced by the Andean peasants in the high and low regions of the Peruvian Amazon watershed. The investigators emphasized that in fifty years the peasants had cleared approximately 6 million hectares. It is estimated that the area will have lost 20 million hectares between 1980 and 1999. The growth of indiscriminate deforestation caused by the highland agriculturists has an exponential increment such that each year the number of cleared hectares rises.

Between 1925 and 1974 a total of 4.5 million hectares were cleared, an average annual deforestation of approximately 90,000 hectares. Most of the deforestation occurred in the upper forest. However, the figure of 90,000 hectares per year is slightly misleading, because the principal migratory movements to the high forest did not start until the 1940s, when major roads to the tropical uplands were constructed (Aramburú 1982). Road construction likely is why the annual rate of deforestation was less than 90,000 hectares from 1925 to 1940 and more than 90,000 hectares after 1940.

Until 1940 the expansion of the economic frontier in the tropical forest

during the cycles of rubber, quinine, and timber extraction did not provoke the expansion of the demographic frontier. The "rubber boom" (1880–1914) did result in an increase of the population of Iquitos from ten thousand to fifteen thousand, but the city returned to its normal population level once the boom was over (Werlich 1968). Only recently—since 1940—has massive settlement occurred in various basins of the upper forest; it has followed road construction, which penetrates the area and connects it with the coastal Andean regions. Nevertheless the expansion of large landholdings in certain areas of the upper forest occurred well before 1940. The haciendas of Cuzco date from the early colonial period (sixteenth century), and the coffee plantations of Chanchamayo were established at the beginning of the twentieth century. The tea and coffee plantations of upper Huallaga date from the late 1940s.

According to the confidential correspondence of the haciendas, or plantations, that operated during the 1940s in valleys such as La Convención in Cuzco (Fioravanti 1969) and the region of Satipo-Chanchamayo, the haciendas did not cultivate more than 5% of their territory during the first three decades of this century. Large plantations, which represented the dominant form of tenancy during this period, do not appear to have caused massive deforestation because labor was extremely scarce (Bedoya 1981).

According to data published in the mid-1980s, the rate of deforestation between 1981 and 1985 was 270,000 hectares per year (World Resources Institute 1986:73). This unfortunately supports the projections established in the 1970s. Furthermore, with coca expansion throughout the high Peruvian forest this figure could easily surpass 300,000 hectares annually. However, Dourojeanni (1984) projects that by the year 2000 only 20% of the deforested hectares in the Peruvian Amazon will actually be used for agriculture or grazing, the rest lying fallow or abandoned. He bases this calculation on current land use in some regions of the forest, where only 1 cleared hectare in 4 is actually used for agriculture or grazing. It is important that the total number of unproductive hectares not be considered as territory at rest or regrowth. Approximately 2 in 5 hectares cleared do not even possess the potential for forest cultivation. Some of these areas include local forests on grades sharper than 40 degrees that are useful only for forest cover in the face of strong rains and the prevention of erosion (Agréda 1984).

One principal reason that protected forests and land with forestry potential is occupied is that roads into the high forest were built through land that is inadequate for agriculture (Dourojeanni 1983). During his first administration Peruvian president Fernando Belaúnde (1963–1968) addressed agrarian underdevelopment by promoting frontier settlement as an alternative to agrarian reform and land redistribution. Belaúnde was thus pressured into tropical colonization projects. In his first administration he constantly confronted a conservative alliance of both traditional landowners and the political party APRA (Cotler 1979). This alliance in the Peruvian Congress blocked all reformist measures proposed for the rural highlands. In this political con-

text the Belaúnde administration concentrated all its efforts on promoting human settlement in the upper regions of the Peruvian Amazon basin.

The government promoted high forestry development by building a network of roads on the eastern slopes that would run parallel to the Peruvian highlands, connecting each tropical valley with the national highway system (Stocks 1988:2). In the past the government had sought the shortest and most economical routes to connect specific regions in the highlands with particular destinations in the upper forest. In contrast, Belaúnde sought a road system that would open up the maximum amount of land to settlement (Belaúnde 1965; Werlich 1968:461). He proposed the construction of the Marginal Highway of the Forest, which would use existing and newly constructed roads to link the highlands and the coast (Werlich 1968:462). To promote economic and agricultural expansion along with road construction the government initiated a massive program of colonization in the valley of the upper Huallaga (Bedoya 1981). Loans from the Interamerican Development Bank financed much of this tropical colonization.

During his second administration Belaúnde promoted the expansion of the *Proyectos Especiales de Desarrollo* (Special Development Projects), which had been started by the preceding military governments. These projects were designed to furnish the techno-agropastoral, social, and infrastructural services that the local colonists in important regions of the high forest required. However, the projects focused on the expansion of the agrarian frontier, which relied on building roads to the tropical regions. Road construction was not accompanied by adequate consideration of marketing, price structure, and technical assistance, as clearly seen in the analysis of the budgeted costs of the projects. In some cases, as for example in Huallaga Central–Bajo Mayo and Pichis–Palcazú, building access roads ate up more than 50% of the budget. For the remaining cases the cost was most important in proportional terms. Only 7% of the total amount was budgeted for forest development and management of the environment (Salazar 1984).

Francisco Verdera (1984:186) rightly indicates that, in a context of relative abundance along the highway infrastructure, the individual adjudication of lands without proper marketing and technical assistance leads to extensive land use. He also states that, according to the plans of the *Proyectos Especiales*, 55% of the total lands to be incorporated in the high forest were classified as "new lands" and the rest as "improved lands." In addition, the activities related to intensifying the use of the land, such as building irrigation works, were concentrated in two projects, upper Mayo and Jaén–San Ignacio–Bagua (Salazar 1984). In the regions of central Huallaga–lower Mayo and the upper Huallaga the projects did not even consider the areas of forest development and environmental control in their budgets and programming. It is logical to argue that a policy of this kind leads to deforestation and an unproductive use of the land.

The unproductive land use reflects the low intensity of the agricultural systems of the tropical forest. This is expressed in the low mean produc-

tivity of the principal crops of the region. For example, according to the data gathered in 1984 and published in the *Encuesta Nacional de Hogares Rurales* (National Survey of Rural Households, Instituto Nacional de Estadística [INE] 1987), both hard yellow corn and rice harvested in the Amazon watershed of Peru represented about 67% and 48%, respectively, of the national hectareage. Thus analyzing the yields per hectare shows that hard yellow corn and rice fell 20% and 32%, respectively, below the national average (INE 1987; see also Verdera 1984). Most of the forest area planted with corn and two-thirds of the rice area are cultivated using the traditional system of slash and burn, with prolonged periods of fallow and an extremely low use of modern technology (INE 1987; see also Verdera 1984). Finally, all this recently accumulated data indicate how important Amazonian agriculture has become to Peru during the last two decades. However, this has occurred at great ecological and economic cost.

Much of the responsibility for the inadequate land management falls on the Ministry of Agriculture, which grants certificates of possession and land titles in protected forests. After cutting lumber, private forest enterprises usually refuse to reforest, arguing that the Ministry of Agriculture grants the farmers titles of ownership or certificates of possession in those areas (Dourojeanni 1983). Additionally, the ministry issues the titles or certificates of possession for lands unsuitable for cultivation; the possibility that these producers will develop a stable and intensive agriculture is quite remote. Most often the peasants cultivate for a short period and then migrate to other areas, resulting in the continued practice of shifting agriculture.

The contradictory results obtained by various land studies in different regions of the high forest have contributed to the irrational management of natural resources. The general tendency of the studies carried out during the 1960s and 1970s was to overestimate the quantity of land with agricultural potential and underestimate the amount of land for forestry and conservation purposes (Dourojeanni 1984; Bedoya 1987). Studies of agrarian Peru have always emphasized the mountains and the coast. The Amazon basin has been perceived, implicitly or explicitly, as an immense free territory to be conquered, with great agricultural potential.

Although more precise data on the differential effects of the large landholder and the migratory agriculturalist in Peru are necessary, the agriculture developed by the small producers is an important element in the expansion of the agricultural frontier and the deforestation of the Peruvian Amazon. Today's economic crisis, which has provoked a surprising resurgence in the peasant economy throughout the country, clearly reaffirms this trend. In addition, according to the national survey (INE 1987), 39% of the national agricultural area is located in the Amazon basin. The total number of agricultural hectares contracted by associated enterprises—agrarian production cooperatives created during the second agrarian reform of the 1970s—shows that the forest encompasses 31.8% of the national area in cultivation. The relatively small difference between both percentages reflects

the fact that the expansion of the agricultural frontier in the Peruvian forest has been produced through the small- and medium-sized agropastoral family units; 64% of these units are farms of 5 to 50 hectares (Bedoya 1991).

Although the interest in cattle raising in the Peruvian Amazon never reached the level or speculative characteristics of Brazil's, in some areas large- and medium-size cattle ranches have been established that have also converted agricultural lands to pasture (Bidegaray and Rhoades 1988). According to William Loker (1989), writing about small- and medium-sized producers in the Andean part of the Amazon watershed, the areas cultivated as pastures fulfill important functions for the colonists. First, they constitute physical proof of land occupation in a context in which property titles are often missing and conflicts over land are part of daily life. Second, the colonists gain income by renting their pastures to neighbors who keep cattle. The colonists are interested in cattle raising because it represents a capital investment that maintains its value in a highly inflationary context (Loker 1989).

The enactment of agrarian reform in colonization zones meant a reorientation from agriculture to meat-cattle production (Ministry of Agriculture 1974:18).² In 1971 four cooperatives of agrarian production and five service cooperatives in the upper Huallaga region began to use lines of credit stemming from Interamerican Development Bank funds primarily dedicated to the purchase of sixty-five hundred head of cattle from Panama and Central America. By 1973 the loans drawn for cattle rose to 59% of the total debt incurred by functioning cooperative enterprises. The turn toward cattle was partially based on soil studies carried out between 1964 and 1970 by the Ministry of Agriculture and the National Office of Natural Resources. This study concluded that 38% of the land in the colonization zone was appropriate for raising cattle (Ministry of Agriculture 1974:54). According to this source, 51% of the soil was considered to have agricultural potential, whereas 11% was suitable for forests, and no land was considered to require protective forest cover. Recent information on the effect of introducing cattle raising into a tropical moist forest region suggests that the study may have been wrong in promoting this form of land use for 38% of the land. Still, the expansion of cattle raising was carried out despite soil studies that showed agricultural activity to be the most suitable use for 51% of the land. Regional development of cattle raising responded to the increase in urban demand for meat and to the industry's relatively low labor requirements.

In the upper Huallaga Valley government cooperatives acquired a considerable number of cattle, and the relative importance of coffee declined. Likewise, new crops such as rice and corn were cultivated in response to new policies of the military government. The cooperatives introduced heavy machinery to clear virgin forests or secondary forest. The region's labor scarcity prompted the decision to use heavy machinery for clearing and made it impossible to quickly switch any of the lands to cultivation. Using machinery on tropical soils was catastrophic, and within a few years

the government cooperatives could no longer pay off their loans on the heavy machinery. Moreover the heavy machinery compressed the soil, producing extremely low yields of both corn and rice and diminishing the nutritive quality of pasture and grazing lands (Ministry of Agriculture 1976:8–10). Low agricultural productivity meant low revenues. In short, labor scarcity influenced the type of technology used, and the technology was highly destructive. Ecological imbalance resulting from the technology caused the government cooperatives to fail.

Coca Production and Deforestation

Coca Plantations, Labor Scarcity, and Deforestation

Coca has been cultivated in the Andes for thousands of years. During the period of Inca expansion in the fifteenth century the Chupaychu ethnic group, centered in the highlands, extended its territorial control toward tropical and subtropical regions to gain access to such resources as wood, feathers, and coca (Santos 1985). During the colonial period the Chupaychu retained access to these regions, although some resources, including coca, were absorbed by Spanish operations based in the tropical region of Chinchao, north of upper Huallaga (Santos 1985). Unfortunately, little is known about the technology used in the cultivation of coca in pre-Colombian and colonial Peru. Studies by W. Guerra (1961), J. Paez (1937), and C. Bües (1937) do indicate that traditional coca cultivation used irrigation and flat terrains or well-constructed terraces.

Directly or indirectly, the cultivation of coca has been one of the most important factors provoking massive peasant migrations to the upper Huallaga region. The contemporary expansion of coca production in upper Huallaga is an expression of deep-rooted cultural traditions as well as an economic necessity. Several factors make coca an important product for highland peasants. Roderick Burchard, in a 1974 study of coca and the exchange of food in that region, described the many social functions, rituals, and economic needs that coca satisfies. First, coca is required in many rituals that form a system of reciprocal exchange between humans and the supernatural. Members of the peasant community, or *comuneros*, believe that if a peasant loses an animal to robbery or death, chewing coca leaves is the only way the supernatural hills will offer him a new animal (Burchard 1974:242). Second, wage workers contracted for work on the family plots are paid in coca (Dewind 1987:303), as is any peasant who assists in community agricultural activity. When a family receives the assistance of another—*ayni*—for one or two days of work on the plot, the family is obliged to give that person coca. In reality, all the adults chew—*chacchan*—coca during *ayni* (Burchard 1974:242). Coca is also an essential component of social con-

sumption for marking changes in community political authorities, festivals, and many other occasions. Third, one of coca's most important functions is to establish a basic means of exchange for all other agricultural products. Because some communities do not possess land that can produce everything they need, they obtain these goods through interregional exchange. For example, in the community studied by Burchard (1974:246–247) not all peasants had land at altitudes higher than 3,500 meters. Therefore they had a permanent shortage of potatoes and other root crops. To obtain these products the *comuneros* engaged in an exchange system in which coca was the main currency. In Tingo María, the community Burchard studied, the rate of exchange was 25 pounds of coca for 1 full sack of potatoes. The corresponding exchange rate in Puquio Pampán was 3 pounds of coca for 1 sack of potatoes. According to Burchard (1974:248), a simple calculation shows that it was possible to convert one sack of potatoes into eight of the same product, entirely through this mechanism of reciprocal exchange among peasants located in different ecological zones. In other words, the peasants used coca to maximize their limited production capacity. In this sense coca functioned as “special purpose money” (Bohannan 1959).³

Coca became a substitute for currency. On one hand, it served to increase the scanty revenues provided by daily wages from the plantations and mines. On the other hand, it partially protected the peasants from inflation. This combination of factors explains the immense interest the *comuneros* had in cultivating coca in the tropical regions. This also explains the peasants' general lack of interest in working for the regional coffee and tea plantations.

Coca generated prosperity for many large, medium, and small plantations in upper Huallaga. These plantations were the most important focal point of migrations from the highlands. In Tingo María 82% of the peasants—men and women—had worked on the coca plantations, Burchard (1974) found. A third of the *comuneros* had coca plots in that tropical zone. In 1962 coca and coffee were the plants yielding the highest economic profit in the area of Tingo María (Servicio de Investigación 1962:17). In this region 75% of the coca estates were cultivating less than 1 hectare, and 24% were working 1 to 10 hectares, whereas 1% were plantations of more than 10 hectares (Burchard 1974:219). The largest estates had an average of 20 cultivated hectares. The biggest three were Shapajilla, Porvenir, and Santa Rita with 67, 26, and 24 hectares, respectively (Centro Nacional [CENCIRA] 1973:248). In all three cases coca production was based on a diversified and complex system of social relations of production. The owners possessed and managed one section of the estate, whereas other plots were managed by the permanent and temporary peasants and their families.

During the 1950s and 1960s the expansion of the coca crop caused a small but prosperous labor market to develop in upper Huallaga. Unlike the situation on the coffee and tea plantations, free laborers, or *huayreros* (a Quechua word), made up a relatively large percentage of the labor force on

coca estates (CENCIRA 1973:244–245). The workers were obliged to attend to the daily tasks of the plantation, directly supervised by the owner. For this they received wages, which occasionally were lower than the tea and coffee estates paid, a ration of coca, and some food (CENCIRA 1973:245–246). The permanent and temporary workers in turn managed plots of staple crops within and outside the estate.

Those peasants who managed coca plantations within the private estates did so under the system of *mejoreros*.⁴ The daily ration of coca, or the possibility of planting it as *mejoreros*, was a powerful labor magnet. Wages were lower than what the coffee and tea estates paid, but coca could be substituted for money in the exchange mechanism. As a whole these estates not only offered the possibility of planting staple crops but also of obtaining coca through diverse means, in addition to money they received for wages.

The development of a labor market for coca crops harmed the coffee and tea plantations, which could not offer rations or coca plots along with the wages. For all these reasons highland peasants preferred to migrate freely to the coca plantations, which aggravated the regional labor scarcity. To compete effectively with coca, coffee and tea plantations would have had to raise wages to a level at which workers could recoup the equivalent of coca rations or personal crop cultivation. Indeed plantations could not solve the problem; they simply could not compete with the coca crop.

The coca plantations, and their subsequent development of a labor market, is one explanation for the extensive cultivation among the coffee and tea plantations. Because of the labor shortage the coffee and tea plantations could not implement an intensive agriculture system. Coffee and tea planters or their administrators never had sufficient labor for weeding and fertilizing their plantations (Bedoya 1993). They could not use modern techniques to avoid diminishing returns. The coffee or tea enterprises thus constantly required the clearing of new plots in order to maintain a certain level of agricultural productivity. In other words, large-scale planters also practiced shifting agriculture.

Coca Farmers and Deforestation

The first period of the military government (1968–1975) saw the continuation of the planned settlement projects, although they were adapted to the agrarian reform policy (Bedoya 1981). The agrarian reform established agricultural production cooperatives but did not properly address the problems of production and productivity experienced by family farms located within and outside the boundaries of the newly formed cooperatives (Bedoya 1981). As a result at the end of the 1970s the upper Huallaga region continued to be characterized by low productivity of legal food crops and minimal use of modern techniques such as fertilizers. The average yields per hectare of rice, corn, manioc, and beans were

much lower than those of upper Mayo, lower Mayo, and central Huallaga. The overall differences in productivity placed the upper Huallaga farmers at a disadvantage in comparison with agriculturalists from other tropical valleys.

The economic stabilization rules imposed by the World Bank and the International Monetary Fund since 1976, which removed subsidies and let the market reflect real scarcities, have reduced demand for foodstuffs. Moreover the terms of trade between agricultural prices and production costs have shown an increasingly unfavorable trend for the producer, especially since 1973 (Alvarez 1983). In the economic crisis of 1981 and 1983 the terms of trade deteriorated even further. In upper Huallaga overall production costs increased 2.7 times more than agricultural prices did (Aramburú, Alvarado, and Bedoya 1985). In this context coca production burgeoned. Furthermore, during the first half of the 1980s the international demand for coca rose by nearly 50%, increasing the levels of coca production dramatically. This was especially apparent in the upper Huallaga region where the amount of land devoted to coca production was conservatively estimated at 24,000 hectares in 1984 and 70,000 hectares in 1986. In other zones increases in the rate of production have not been as great but continue to climb steadily (ECONSULT 1986). In 1986 coca production could have contributed to the deforestation of 150,000 hectares. Because of the deep economic crisis that has gripped Peru since late 1987—with negative indexes in nearly every indicator of economic growth—coca production has expanded considerably. In the region of San Martín, where the largest number of coca plantations and the Upper Huallaga Special Project (PEAH) are located, the figure may approach 300,000 hectares.⁵ This is five times the amount of land planted in corn, which in 1988 constituted the most important legal crop in this region (Loker 1989).

The Tingo María region of the upper Huallaga Valley is officially considered a national park. Similarly, other national parks, like that in Abiseo located in the Department of San Martín, and national forests, like that of Von Humboldt located in Ucayali and Huánuco, or Biabo in San Martín and Ucayali, have also been invaded by coca-producing peasants. As the economic crisis in Peru continues to worsen, and the prices for legal agricultural products remain low, the expansion of coca production will continue at its current rate. It seems likely that the annual rate of destruction will reach higher levels, and the gravity of the ecological problem will acquire larger dimensions.

Coca farmers both inside and outside the boundaries of the project area have chosen locations far from the main highways to avoid police repression. As in other upper forest regions coca is cultivated not only on land appropriate for agriculture but also in areas suitable for forestry. The hill-sides are the safest alternative, but although it is a permanent crop, coca has the harmful effects of an annual crop when it is cultivated on defor-

ested steep slopes, especially because it is typically cultivated in vertical furrows rather than in terraces that mitigate the damaging effects of rain (Dourojeanni 1989; Bedoya 1987).

In the 1980s fallow agriculture covered most of the area delimited by the PEAH. This extensive land use is also one significant effect of coca production on legal agriculture in upper Huallaga. Farmers have directed land, capital, and labor to coca production since the late 1970s, because they found it more profitable than other crops. In the interior of the PEAH area such crops as yellow maize and rice, cultivated using a fallow system, have been slighted by increasing production costs brought about by the expansion of coca production. As table 7.1 shows, the small plot of coca is surrounded by large areas of extensively cultivated annual food crops and permanent cash crops. An important issue is the destination of noncoca production, particularly annual crops. Annual crops are consumed by farming families in addition to being sold, although prices are normally low. Food is also provided to hired workers as part of most labor arrangements.

Competition by coca production led to a chronic labor shortage for legal agricultural crops. The expansion of coca has also deterred the development of technology specifically related to the production of legal crops. In upper Huallaga most of the fertilizers and pesticides are used on coca plantations (Aramburú, Alvarado, and Bedoya 1985). Almost all yellow corn and rice is cultivated by using slash-and-burn agriculture, incorporating little modern technology. The 1980s saw no significant expansion in total hectares under cultivation or in the productivity of the most important legal crops within PEAH boundaries. The main goal of the farmers was to intensify coca production on hillsides and underuse the plots with better soils because of the low value of most legal crops. This strategy of extensive land management—although the coca plots are actually intensively cultivated—results in continued deforestation.

Deforestation caused by coca production in upper Huallaga does not seem to be as serious when analyzed plot by plot, until we consider the large number of agriculturalists, both inside and outside the borders of the PEAH, who have cleared steep slopes to cultivate coca. Using the information gathered in 1981 from the National Foundation for Development (FON), we found that among 348 farmers from upper Huallaga, 136 were coca producers. Our study analyzed agricultural systems and the rate of deforestation among the coca farmers. The annual deforestation rate is clearly determined by extensive soil use and not by the number of coca hectares. The extensive agricultural system means that the bigger the plot, the higher the annual deforestation rate and the higher the annual increase in fallow areas in relation to a relatively smaller increase in the cultivated area (see columns 8, 9, and 10 in table 7.1).

Table 7.1
Coca Hectares, Annual Rate of Deforestation, Annual Increase of Agricultural and Fallow Hectares,
According to Plot Size Among Coca Producers in Upper Huallaga in 1981

Plot size	(1) Percentage of cases	(2) Average plot size (ha.)	(3) Average of coca (ha.)	(4) Average of cultivated hectares (annual + permanent crops)	(5) Average of natural and cultivated pastures (ha.)	(6) Average of fallow hectares	(7) Total cleared area (ha.) (3 + 4 + 5)	(8) Number of years occupying plot	(9) Annual increase of agricultural hectares	(10) Annual increase of fallow area*	(11) Annual rate of deforestation†
0.1 < 10	13.0	8.59	0.91	4.11	0.19	2.50	6.80	11.13	0.37	0.22	0.61
10.1 < 20	45.0	15.71	1.14	5.93	1.48	4.54	11.95	10.91	0.54	0.42	1.10
20.1 < 30	21.0	24.20	0.97	6.06	2.44	8.84	17.34	13.88	0.44	0.64	1.25
30.1 +	21.0	45.61	1.02	6.92	8.49	12.67	28.08	10.07	0.69	1.26	2.79
Total	100.0	22.89	1.05	5.93	3.00	6.89	15.82	11.18	0.53	0.62	1.42

Source: Elaborated from National Foundation for Development survey (1981)

* Col. 3 divided by col. 7

† Col. 5 divided by col. 7

‡ Col. 6 divided by col. 7

The information that we pulled from the National Development Foundation figures reveals an average of 1.05 hectares of coca per family plot. As in the Chapare region of Bolivia, the colonists in upper Huallaga are not seeking to maximize coca production (Painter and Bedoya 1991). Table 7.1 shows that the size of the family plot and the number of coca hectares have no relationship. The average number of coca hectares ranges from 0.91 to 1.14. As in Chapare the risks associated with a crop that is subject to price instability and police repression are the main reasons that coca producers are cultivating smaller coca plots.

The annual rate of deforestation from coca production is less than that from holdings cultivated only with legal crops (compare table 7.1, column 10 with table 7.2, column 10). If we compare the information related to deforestation rates of both groups, we find that for each range of plot size the coca producers have a lower rate of deforestation than the legal producers. The noncoca producers also have a higher annual increase in fallow area (compare table 7.1, column 9 with table 7.2, column 9). Furthermore, for 51% of the land area of the coca producers, the cultivated area is larger than the fallow area. On the land of the noncoca farmers 66% of those farmers have fallow areas larger than their cultivated areas. In other words, the legal producers use more area of land in their type of cultivation than do the coca farmers. This is provoked by the extremely high profitability of the illegal coca economy compared with the legal agricultural economy. When coca prices are high, the profitability is three or four times more than other crops such as cacao (*Theobroma cacao*), which is the next most lucrative legal crop.

This economic disparity has led to a relocation of human and economic regional resources toward the production of coca. As in the 1950s and 1960s, when coca plantations attracted the majority of wage laborers, in the 1980s small coca producers generated the most dynamic sector of the labor market, thus causing a regional labor shortage. The legal farmers suffered labor scarcity because of the elevated wages paid to the hired workers by the coca producers (Bedoya and Verdera 1987). Of all the farmers who had labor shortages, 74% were legal agriculturalists and 26% were illegal producers. Labor scarcity did not allow legitimate farmers to implement intensive agriculture. Similarly, the relatively low economic productivity of legal farming led to the extremely low use of modern farming techniques. Only 1% of the legal farmers used fertilizers, whereas 18% of the coca producers did. It is important to note that coca prices were at a very low level when the FDN survey was taken. During periods of higher prices most coca producers use modern techniques such as fertilizers. Although coca cultivation increased at the expense of legal crops, it was the hillside forests that were affected most negatively. The intensification of land use was concentrated in the hillsides outside the boundaries of the Special Project, where the greatest number of monocrop coca farmers exist. The size of the coca

Table 7.2
Annual Rate of Deforestation, Annual Increase of Agricultural and Fallow Hectares,
According to Plot Size Among Noncoca Producers in Upper Huallaga in 1981

Plot size (ha.)	(1) Percentage of cases	(2) Average of plot size (ha.)	(3) Average of cultivated hectares (annual + permanent crops)	(4) Average of natural and cultivated pastures	(5) Average of fallow hectares	(6) Total cleared area (ha.) (3 + 4 + 5)	(7) Number of years occupying the plot	(8) Annual increase of agricultural hectares	(9) Annual increase of fallow area*	(10) Annual rate of deforestation†
0.1 < 10	15.0	7.61	4.47	0.68	2.29	7.44	9.83	0.45	0.23	0.76
10.1 < 20	34.0	16.34	6.18	2.40	6.18	14.76	7.38	0.84	0.84	2
20.1 < 30	21.0	29.94	5.24	2.83	9.90	17.97	10.73	0.49	0.92	1.67
30.1 +	30.0	57.19	8.04	13.28	15.16	36.48	10.86	0.74	1.40	3.36
Total	100.0	29.18	6.30	5.52	9.09	20.91	9.48	0.68	0.94	2.16

Source: Elaborated from National Foundation for Development survey (1981)

* Col. 3 divided by col. 7

† Col. 5 divided by col. 7

‡ Col. 6 divided by col. 7

plantations in this zone varies from 2 to 3 hectares. These plantations are intensively managed and use many modern farming techniques. Inside the boundaries of the Special Project the strategy of extensive land management results in continued deforestation. On the hillsides negative ecological consequences result from the large amounts of chemical compounds used to produce cocaine paste (Dourojeanni 1989) as well as from the process of deforestation. Expanding coca production in the upper Huallaga region has produced a curious pattern in which the lands under extensive cultivation are located closer to main highways. Plots that are monocropped in coca and under intensive cultivation are located in regions more remote from the Marginal Highway and other routes of communication. This trend is the opposite of that predicted by modern theories of agricultural intensification.

Coca Eradication and Shining Path

Another important factor in the destruction of the rain forest is the program of eradication aimed at reducing the amount of coca production. The eradication campaign being carried out in the upper Huallaga region offers a clear example of the problem. Eradication has been initiated in the southern part of the valley along the eastern margin in the vicinity of Tingo María. The agriculturalists moved north and opened new fields for their coca plantations when they learned about the program.

As the eradication program spread to northern regions, the peasants resumed their migratory patterns and moved to more remote areas of the valley or to other areas, such as the central Huallaga and the Aguaytía zone of Pucallpa on the Ucayali River. The dynamics of the coca eradication program and of peasant migration have led to a general dispersion of coca plantations throughout the entire forest. This also explains why most coca producers cultivate several dispersed plots of the illegal crop. This has also contributed to the massive deforestation of areas designated as protected forest zones, or national parks, with all the negative consequences mentioned previously.

The problem of deforestation exacerbated by expanding coca production and corresponding policies of eradication is not confined to the national economy or to the institutional decisions related to the eradication campaign. The dilemma of coca and deforestation has important political dimensions. The agrarian reform eliminated the political and social elite constituted by the regional owners of the coffee and tea plantations in upper Huallaga and failed in its attempt to create a new political elite through the regional government bureaucracy and the cooperative leaders. This political vacuum, plus the weakness of the government's hold on tropical demographic frontiers such as the Peruvian Amazon basin, eased

the expansion of coca cultivation and political organizations such as the Shining Path—*Sendero Luminoso*.

The political terrorist organization Sendero Luminoso maintains a significant presence in the upper Huallaga region. It is the only organization that openly defends the rights of the peasant coca producers, which guarantees its members legitimacy within the region. Sendero does not limit itself to organizing and mobilizing the peasant population through terrorist methods; it also encourages them to undertake continuous migrations in order to avoid the eradication program and police repression. Sendero Luminoso has thus pressured peasant agriculturalists into relocating to the most distant and fragile zones of the upper Huallaga.

Another aspect of the problem is the type of war that the Peruvian government has organized against the narcotraffickers and organized terrorists. Despite evidence of ties between these sectors, government institutions have treated them as two distinct battle fronts (ECONSULT 1986). The government strategy has been to concentrate all its efforts for a given period on one sector, leaving the other relatively free to operate. When the government decided that Sendero was becoming too powerful in the region, it abandoned its struggle against the narcotraffickers and withdrew the U.S. Drug Enforcement Administration (DEA), Mobile Rural Patrol Unit of the Peruvian Civil Guard (UMOPAR), and the eradication program and shifted to the military suppression of the guerrilla terrorists. Control over narcotraffickers virtually disappeared, leading to an increase in coca production in the area. In ecological terms this signaled an accelerated rate of deforestation.

Once the Peruvian government determined that Sendero was relatively under control, the military withdrew, police forces returned to fight the narcotraffickers, and the eradication program was reinstated. Sendero then reorganized and mobilized the peasant population to migrate to other regions. The deforestation resulting from the planting of new coca fields occurred repeatedly. It has become clear that both government strategies of repression carry weighty ecological implications.

One final aspect of the problem is ideology. According to our experience in the region, Sendero typically seeks to control a specific portion of the coca producers. The guerrillas try to persuade these peasants not to grow cash crops and to instead produce crops for family consumption while cutting back on coca hectares. Its antimarket ideology explains Sendero's actions with respect to the coca producers of the Huallaga region. The guerrillas require the peasants to pay tributes, and coca becomes a necessary exception to their rigid and dogmatic ideological scheme. Here again the ecological problem arises. Because Sendero promotes the development of economic self-sufficiency, which means extensive cultivation with slash-and-burn agriculture, the inevitable result is deforestation. Limiting the amount of deforestation in the upper Huallaga requires restrictions on the

expansion of the coca plantations and reductions in coca production. The government must control both the national economy and Sendero Luminoso.

The tremendous amount of deforestation in the upper Huallaga region is not only a result of coca expansion but also of several decades of inadequate government economic policies. The extensive soil use in the Peruvian upper Amazon begins with the development of a government policy that promotes the expansion of the agricultural and demographic frontier through the construction of roads in fragile ecosystems, altering the productive conditions of the impoverished colonists. This political and economic policy was maintained throughout the 1960s, 1970s, and 1980s. Several colonization projects did not improve the peasant productive organization, and no attempts to formulate a stable ecological policy were made. Emphasis on road construction led to extensive soil use that was highly destructive to the environment. Likewise, regional political relations and labor scarcity forestalled any possibility of developing an intensive pattern of agriculture. Deforestation caused by coca producers is a consequence of traditional methods of shifting agriculture, practiced by impoverished farmers and never modified in several regions of upper Huallaga. The coca economy consumes most of the region's productive resources and deters the technological development of legal economy. As in the past, this has led to expansion of shifting agriculture and an increased rate of deforestation.

Notes

1. 'Upper forest' is the translation of the Spanish *selva alta*, a recognized ecological zone of the Peruvian tropical forest that lies between the eastern Andean slopes and the Amazon basin at an altitude of 400 to 800 meters.

2. From the time of the military coup on October 3, 1968, the military regime led by General Juan Velasco implemented and carried out the most extensive plan for structural reform in the republican history of the country. In general terms this was a government revolving around the redistribution of national revenue, the nationalization of petroleum, the banking industry, and other important sectors of the economy. Ideologically speaking, the military government tried to distance itself from both socialism and capitalism (Pease 1977). The military government implemented one of the most radical programs of agrarian reform, which affected the large agroindustrial complexes of the northern coast, the traditional haciendas of the Andean highlands, and the modern plantations of the upper forest. The reform generally was an attempt to substitute the former land tenure system and rural economic structure with a more efficient capitalist pattern (Caballero 1981). Rural reform meant transforming private agrarian companies into agrarian production cooperatives.

3. The only economic sphere in which I verified that coca was not used as a

means of exchange was in the acquisition of land. For this reason we do not refer to it as general purpose money.

4. José María Caballero describes the social organization of the forest plantations, differentiating them from the highland haciendas: "The typical colonist—called *mejorero*—was a worker who was paid by the job, in charge of putting wilderness areas into production. He was paid in money, through a system of advances, based on the amount of land improved. He was authorized to grow crops for his own subsistence on small marginal plots" (1981:263). Care of the established cultivated crops was covered, at least on most plantations, by the bonded workers who were partially paid with money and partially through the right to clear land and grow crops for their own consumption.

5. To tackle the problem of coca expansion in upper Huallaga, the United States and the Peruvian government in 1981 designed Project Paper to carry out PEAH. The design included research, extension, highway maintenance, and credit development. Furthermore, Project Paper excluded work in steeply sloping areas, where a significant number of coca producers are settled. Because PEAH's work was limited to farmers in flat areas, the effect of the project on coca producers was limited from the beginning (ECONSULT 1986). Unfortunately, forestry was not even considered. This was a serious shortcoming in a region in which a considerable proportion of the land is classified for forestry use (Bedoya 1987).

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